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SOME ECONOMIC ASPECTS OF THE WORLD WAR. II

The Espionage Act and the Trading-with-the-Enemy Act

Under the Espionage Act and the Trading-with-the-Enemy Act all exports and imports are placed under the control of the President with authority to delegate his powers. The control of exports was first exercised by the Exports Council, later by the Exports Administrative Board. This power still later passed to the War Trade Board, and there was added the control of imports. Orders have been issued so that at the present time the exportation and importation of all commodities of importance are completely controlled. The exportation of some is altogether prohibited and others prohibited except to our associates in war. Imports are likewise controlled in an appropriate fashion. Trade is altogether prohibited with the enemy or ally of the enemy; and with some 1,600 firms in neutral countries.

These regulations are exercised through licenses; and there is absolutely no exportation or importation of goods except by those who have licenses approving the particular transactions.

The Railroad

The Priority Administration is organized under the Priority Act. This act compels the railroads of the United States to handle all the transportation business of the country as the President directs. Under the act the President appointed Judge Robert S. Lovett Priority Administrator. In his work the administrator has had the cooperation of the carriers, of the Inter-

state Commerce Commission, and of the other special war administrations.

The Priority Administration has given a number of special orders for preference in shipment, and finally has issued a general priority order, which indicates the precise preference in handling the commodities which are necessary directly to carry on the war or indirectly to support the carrying on of the war, such as food, feed, and fuel. In short, the railroads must first provide for all of these needs in the order prescribed, ranging from steam railroad fuel through foods, to fuel necessary for domestic purposes, the public utilities, and for essentual manufactories, etc. Only after these needs of transportation are provided for can the railroads handle other business.

In obeying the directions of the priority administration, the railroads are, by the terms of the Priority Act, freed from the penalties of the Sherman and other anti-trust laws.

The situation above described in regard to transportation was that in force until December 28, 1917, at which time everything was changed by the action of the President herein summarized.

In the act approved August 29, 1916, making the appropriation for the support of the army for the year 1916–17, the President was empowered through the Secretary of War to take possession and assume control of the transportation of the country for war purposes; and also "for such other purposes connected with the emergency as may be needful or desirable." A state of war was declared to exist between United States and Germany, April 6, 1917, and between the United States and Austria, December 7, 1917. Based upon the power vested in him by the above measures, the President on December 26, 1917, by proclamation, took over the entire railroad system of the country and also the boats which are operating in connection with such railroads. The proclamation not only applied to the railways, but to the terminal companies and all the equipment of the railways of every kind. William G. McAdoo was appointed Director General of the Railroads. The proclamation became effective December 28, 1917, at 12 o'clock, noon, and the transfer of accounting took place at 12 o'clock, midnight, December 31, 1917.

Upon December 29, the Director General issued his first order. It was directed that the transportation system covered by the proclamation shall be operated as a national unit and that all facilities shall be used so as to give the highest efficiency. Routes designated by shippers are to be disregarded if these would interfere with the speed of transportation. Traffic agreements between carriers are not to interfere with the expeditious movements of freight. Through routes which have not heretofore been established because of short hauling or other causes are to be established and used wherever expedition will be promoted.

On January 4, 1918, the President addressed Congress in regard to the action which he had taken. He recommended that the compensation of the railroads for the service during the time they are under the management of the government should be the average of the net railway operating income for the three years ending June 30, 1917, and that the owners of the stocks and bonds of the railroads be guaranteed that they would receive this income.

On the same day a bill was introduced into Congress which proposes to carry out this recommendation. The measure also provides for an appropriation of $500,000,000 as a rotating fund to operate the railways and to provide for the necessary additions, betterments, rolling stock, etc.

Many other features are embodied in the bill which it is not necessary to discuss. The control of the transportation system is to continue for the period of the war, and thereafter until otherwise ordered.

Taking over the transportation system of the country and operating it as a unit makes without force all of the antitrust laws. Instead of prohibition of the co-operation of the railroads, pooling, etc., there is a positive order that there must be the most perfect combination of all of the facilities of the country to give the highest efficiency. So far as the railroad system of the country is concerned, the antitrust laws are abolished for the period of the war.

The War Industries Board

The War Industries Board is a creation of the Council of National Defense. At the request of this board the producers agreed to maximum prices for copper, and for the more important forms of iron and steel. The prices fixed are the same throughout the country, except such allowances as are made for differentials due to freight, etc. Since the demand exceeds the supply, the maximum price is the price which obtains. Therefore producers of copper, iron, and steel sell at a definite price without regard to who is the purchaser. Competition in price is completely eliminated.

These agreements have been approved by the President. They have therefore the sanction of the law so far as the purchases of the government are concerned, since Section 120 of the National Defense Act authorizes the President to fix the price of all commodities for the government necessary for the prosecution of the war. But agreement upon prices for copper, iron and steel paid by the public have no warrant in congressional action.

The prices are large reductions from those which obtained before the agreements were made, but are much higher and in many cases at least twice as high as those which prevailed in the pre-war period.

Also, by the request of the War Industries Board, the manufacturers have agreed to a definite order of preference. Under this priority agreement, first are to come war orders; second, those which are, while not directly for the war, of public interest and essential to the national welfare; and third, unessential commodities. Each manufacturer obtains permission of the War Industries Board to execute any order, and further executes its orders in accordance with the preference rules of the board.

Thus the War Industries Board through request has secured not only the agreement of the manufacturers in regard to the prices of steel, iron, and copper, but the preference in which the work is done. The steel and copper businesses are regulated to a large extent in the same manner as food and fuel are controlled in consequence of Congressional enactment.

Regulation by the Federal Court

The Federal Trade Commission by the direction of Congress investigated the print paper business and reached the conclusion that the control of this industry should be taken over and operated by the government during the war, and so recommended. Action by Congress upon this recommendation is pending.

In the meantime the Attorney General brought suit against the News Print Manufacturers' Association under the antitrust laws. The suit was not contested and the court issued a comprehensive order that the Manufacturers' Association should be dissolved. The Association and a number of its officers were fined. At the same time this was done the court entered into an agreement with each of the firms making up the Association, some forty in number,

in regard to the maximum price which should be paid for the different kinds of print paper for a period of three months, and after that term delegated the same authority to the Federal Trade Commission to the end of the war and three months thereafter.

All the members of the dissolved association entered into a contract with the court to execute this agreement. The manufacturers agreed with the court in the fixing of maximum prices throughout the country. Since, however, the demand is in excess of the supply, these maximum prices are in fact the prices everywhere paid.

Thus by court action, without any change of the law, the same results are reached for the control of prices of paper as are reached by the Food and Fuel Administrations concerning food and coal in consequence of the law and by the War Industries Board for the control prices of copper, iron, and steel. The reason given by the court for the exercise of this authority was, that in the present condition of affairs in the United States, it was desirable that some adjustment of the controversy be made.

THE PRINCIPLES UNDER WHICH MAXIMUM PRICES HAVE BEEN FIXED

In all of the price regulations, the board or other agent has had the very delicate task of so fixing the price that there will be a very large production without raising it so high as to be unreasonable. With liberal prices there is a strong incentive to increased production. If the price of a commodity were not only liberal but very high, the production might be still further slightly increased; but this final increment would not be sufficient to compensate for the higher price for all of the commodity to the public.

There is difference of opinion concerning the soundness of judgment which has been exercised in price control; but it is noticeable that the criticism has been from both sides. The producers have held that the prices are not adequate; the consumers have felt that they are too high. As an illustration of the former, it may be mentioned that there is discontent among the farmers with the price fixed for wheat, although this is more than twice as high as that before the war. Similarly some of the coal producers have held that the prices which have been allowed are too low, although they are upon the average more than twice as high and in many instances thrice those that obtained before the war; and the profits of the operators are unquestionably much greater. On the other hand, the consumers have felt that the prices fixed for copper, iron, and steel are very high, yielding as they do enormous profits to each of the great producers.

It is, however, to be said that in all cases the administrative responsibility, in controlling prices, has been exercised by a group of men which has included representatives of producers, distributers, and consumers, and presumably upon the whole they have been determined as nearly right as is practicable for human beings acting under the stress of a great national emergency.

The regulatory measures have demonstrated that under a proper system, maximum price control is practicable; and, therefore, in the future, discussion should be limited to the question as to whether or not such price control is expedient; that is, whether or not it is advantageous or disadvantageous to the public.

Whenever, heretofore, price fixing has been advocated it has always been met with the objection that the proposal is impracticable. It has been said, if the government fixes prices, secretly they will be disregarded. This theoretical objection must

now face facts. The maximum price for wheat and its products, for fuel of different classes; for copper, iron, steel; and for print paper, have been controlled by governmental action; and these are the prices under which substantially all transactions have been carried on. There have been minor variations from those fixed, as illustrated by secret excessive charges for sugar; but as soon as such cases have become known, prompt punishment has come by compelling restitution or revocation of licenses. Excluding from consideration those dealings which have been made under contracts enforceable in law and made prior to the promulgation of regulatory measures, it is safe to say that more than 95 per cent. of the dealings in commodities in which maximum prices have been fixed have been within those prices.

It is to be noticed that this success has not been achieved simply by enacting regulations in regard to the maximum prices and leaving to the police offices and courts the problem of enforcement. All such attempts at price regulation have failed; and any similar future attempt would be certain to fail; just as the laws against discriminations, rebates, drawbacks, etc., for the public utilities failed as long as left to the courts for enforcement. These latter measures succeeded when an agency was created—the administrative commission or board—whose exclusive duty it was to see that the utilities laws were obeyed.

In the case of the present sucessful price-fixing movement, the controlling agencies have even greater powers than the utilities commissions. Through the license system, they inquire into charges and limit them at each stage of the process of distribution. For wheat and coal, the agencies have had also the authority to buy and sell the entire product of the country; and, for wheat, the power has been exercised to the extent necessary to accomplish the desired end.

Therefore, the regulatory movement developed during the war has shown the way in which the principle of maximum price fixing can be carried out. This is not the least of its achievements; for no one supposes that maximum price-fixing can succeed, administered in an arbitrary manner and irrespective of cost. It was the combination of the exercise of broad powers through licensing, careful inquiry into cost, and giving due consideration to the necessity for large production that success in price control has been obtained.

REGULATORY MEASURES AND THE ANTITRUST LAWS

The facts presented show that for food, fuel, copper, iron, steel, paper, and transportation by land and water, the principles embodied in the Sherman and other antitrust laws are directly contravened.

The fundamental ideas of the Sherman Act are that trade is controlled by the law of supply and demand and that in manufacture and transportation all are on an equal footing. Commodities are to freely flow as required by competition. If there is a shortage, the highest bidder will have his necessary needs met. There must be no cooperation in distribution. The common carriers must show no discrimination in goods. If there is cross freight, this is immaterial. The carrier must ship the goods as asked by the shipper.

Every one of these principles is directly violated under the control exercised through the war measures. Prices instead of being variable are the same for the same commodity at the same locality. For wheat the price is to be neither higher nor lower than that fixed by the Food Administration. For fuel, copper, iron, and steel, only maximum prices are fixed, but since the

demand exceeds the supply, the maximum prices are those in fact everywhere paid. The difference in prices for a commodity at different localities is only that necessary to compensate for freight differentials and other conditions.

In the matter of distribution, commodities do not go to the highest bidders but to the persons and places indicated by the control. The wheat and sugar remain at home and are sent abroad in proportions decided by the Food Administration. Fuel is furnished to the government and to corporations and individuals as decided by the Fuel Administration. Copper, iron, and steel are first to go directly to war purposes, then to purposes which are indirectly to assist in the war, and only what is left may go to unessential industries.

If the prosecution of the war is best furthered by so doing, commodities are sent abroad. If to do this it is necessary to curtail the home consumption, this is done. The control of exports and imports through licenses is completely in charge of the War Trade Board. The common carriers instead of acting independently and handling goods without discrimination must so cooperate in avoiding cross haulages as to give the highest efficiency; and they must handle goods in the order that the director general indicates.

In short, there is governmental control of many phases of industry and commerce for a number of the most essential commodities.

By express act, any form of cooperation in shipping which meets the approval of the Shipping Board, even to the extent of pooling, is exempted from the antitrust laws. The same is true for the railroads acting in accordance with orders of the Priority Administrator. No such express exemption is made for the agreements in regard to food and fuel. It is to be presumed that for these commodities the enactments of the food and fuel laws by Congress may be construed as repealing the anti-trust acts so far as the particular authority of these laws goes. Thus the fixing of the price of wheat and the control of wheat as a government monopoly are authorized by law enacted later than the Sherman and other antitrust acts; and they, therefore, in effect repeal these laws as far as these transactions are concerned.

However, for the transactions of the War Industries Board, there is no express law authorizing the copper, iron, and steel men to agree upon prices and to recognize priority. This board makes requests rather than issues orders. The price fixing is by agreement. These agreements may have the sanction of law by implication, so far as the purchases are by the government under section 120 of the National Defense Act. But it is clear that in agreeing upon prices for the public, the copper, iron, and steel men are violating the antitrust laws, and they are so doing by request of the War Industries Board, an instrument of the National Council of Defense, and with the approval of the President.

Incongruity of the Regulatory Measures and the Antitrust Acts

At the very same time these agreements are being made and are in force, the United States Steel Corporation is before the United States Supreme Court, charged with violating the antitrust laws by cooperation in controlling prices. Even if the charges are fully sustained, they do not go so far as the cooperation of the copper, iron, and steel men in response to the request of the government. Is this not indeed an extraordinary anomaly?

If the Steel Corporation is dissolved by the Supreme Court in consequence of the prosecution of the Attorney General, this

dissolution will be caused by actions less in violation of the law than those which the Steel Corporation has subsequently done at the request of the War Industries Board.

But the most curious anomaly of all is that in regard to book paper. The manufacturers of book paper are indicted for price fixing. The organization under indictment is dissolved and several of its members are fined. The court itself then enters into a contract with these same manufacturers to fix for three months the maximum price for print paper at somewhat lower rates than those fixed by the combination itself. The contract grants authority to the Federal Trade Commission to continue maximum price fixing throughout the war and three months thereafter.

Regulatory Measures Beneficial

Few, I suppose, will question that the regulatory measures authorized by law and those taken, without such authority, have been not only a benefit to the people but essential for the successful prosecution of the war. They have resulted in checking the enhancement of prices for essential commodities which, before these regulatory measures were enforced, were sailing skyward. Not only have rising prices been checked, but for many of the commodities they have been reduced—for food, fuel, and paper, moderately, and for copper, iron, and steel, largely. Also great economies have resulted from dividing orders among the different plants in such a manner that each does the work for which it is best fitted and nearest the location at which the commodity will be used. Already great additional economies have come from operating the carriers in such a manner as to reduce cross haulage and to lessen congestion. Also through the future operation of the railroads of the country as a unit under a Director General vast additional economies are certain to be introduced.

The diversion of the wheat for export to the South instead of through the congested centers of the North and the East at a time when the transportation facilities of the country are taxed to the utmost is a vast economic gain. Also the diversion of the coal to the upper lake ports in advance of the closing of navigation will prevent great hardship which otherwise would have been inevitable.

Thus the majority of people will agree that the authorized exemptions from the antitrust laws, the exemptions from these laws by implication, the ignoring of them by the War Industries Board, and the action of the Court in enforcing them against the manufacturers and itself violating them, have all been beneficial.

Reconciliation of Anomalies

But the question arises whether all of these anomalies can be reconciled. The answer is yes. Amend the first section of the Sherman antitrust act, which forbids restraint of trade through combination and contract or by monopoly, by adding the clauses, "The restraint of trade meant by this act is that restraint of trade which is detrimental to the public welfare; and the presumption is that any restraint of trade is thus detrimental and to become legal must be approved by an appropriate governmental agency." Without special exceptions, if this amendment were made, it would legalize the cooperation of shipping, the cooperation of the railroads, and the actions of the Fuel and Food Administrations, the War Industries Board, and the Federal Court.

The facts presented show that cooperation by combination, contract, or monopoly may be beneficial or detrimental. Too frequently, when the control of the market

and monopoly have been in private hands without regulation, it has been detrimental; indeed so detrimental that this led to the enactment of the antitrust laws. When the control of the market or monopoly is, however, subject to governmental regulation, it may be highly beneficial; not only beneficial, but at a time of war, absolutely essential. The sanction, as far as public opinion is concerned, of all of the regulatory measures in regard to ships, railroads, food, fuel, copper, iron, steel, and paper, is that they have been a benefit to the people and have been essential for the successful prosecution of the war. There would have been no question about the legality and propriety of these acts, had the Sherman Act been amended in accordance with the suggestion made.

THE CONTINUATION OF REGULATION AFTER THE WAR

All the regulatory measures considered are for the duration of the war or for a limited period thereafter. If no action is taken by Congress, they will expire at varying intervals following the conclusion of peace.

Future Regulation to be based upon the Public Interest

The regulatory laws discussed are all based upon the war powers of Congress. In each one of them it is declared that the act is necessary for the public security and defense. If they are to be continued after the war, it must be upon the basis that the matters with which they deal are affected with a public interest; that is, the regulation, if continued, must be on the same principle as that which applies to the public utilities. Many of the utilities have received special privileges involving franchises; but irrespective of this, it is well established that regulation may be applied to any business which is affected with a public interest. This goes back to the grain-elevator case, in which this broad principle was definitely settled. Can any one doubt that the business of an organization which controls half of the iron ore resources of the country, a large percentage of the coking coal, and manufactures half of the iron and steel of the nation is affected with a public interest? Or that the same is true of dealings in the most fundamental food commodities, such as wheat, sugar, meats, and fats? Therefore, undoubtedly Congress has the power to continue the regulatory measures after the war. This then raises the question should they be allowed to expire or be continued. The obvious general answer is that so far as they will be beneficial to the public they should be continued, but so far as they will be detrimental they should terminate. The difficulty will be in indicating those measures which under normal conditions will be beneficial and those that will be detrimental. In considering this problem, there are certain general considerations which should have weight.

Regulation Necessary to meet Foreign Competition

It is certain, that, following the war, combination abroad will be general. Already Germany is considering buying and selling nationally; and whether or not she decides to do this as a direct governmental activity, there is no question that the trading by Germany in any commodity will be done, if not through a single organization, at least through such a limited number that they will perfectly cooperate in their production and distribution.

Furthermore, it is highly probable that this cooperation will be extended so as to include her allies. Under these circumstances it is certain that any attempt to

meet Germany in world trade through the individualistic method under the law of supply and demand can not have the highest success. If we do not meet Germany's competition by national organization as efficient as her own, we may as well at once concede that Germany will gain a predominant position for those industries for which she has adequate resources.

Already this has been appreciated by Congress; and there is now in conference the Webb bill which, if enacted, will permit cooperation in foreign trade. This bill proposes to remove the handicap in selling goods abroad; and thus is in the right direction. It does not, however, permit cooperation in production within the United States; whereas such cooperation through cartels is legal in Germany. This powerful advantage Germany will retain. But if to meet this situation it be decided to permit cooperation within the United States, regulation is inevitable. If industry and commerce are freed from the restraints and penalties of the antitrust laws, there must be governmental agencies that shall see that advantage is not taken of the public in consequence of this fact.

Continuance of Regulation required to meet Needs of Allies

There is still another aspect of the question of continuing regulation which requires consideration. For a considerable period after the war, the demand for food and other essentials will be excessive. The cereal production of Great Britain, France and Italy has declined alarmingly during the war, because of lack of fertilizers and insufficient labor. Their herds are greatly depleted. These tendencies will continue throughout the war, so that their agricultural production will become even smaller. It is probable that for a long time, possibly for several years, we may have an insufficient surplus to even meet the legitimate needs of our associates in war; indeed it is little short of certain that this will be true for a number of commodities.

Shall we revert to the law of supply and demand under competition, and allow goods to be exported in unlimited quantities and without preference?

I do not know the answer others will make, but, for myself, it seems clear that the necessities of the allies must be met not only during the war, but for a sufficient period after the war so that their agriculture and industries may be rehabilitated; especially as such rehabilitation in Belgium, northern France and Serbia, is largely necessary because of ruthless and unecessary destruction of property on a vast scale by the Central Powers and because of heavy drafts upon their financial resources wholly unwarranted by international law.

If the country accepts the answer suggested, it will require at the least that exports be controlled. Also if I am correct in believing that the demands for essential commodities after the close of the war will exceed the supply, the control of prices must continue, otherwise there will be another period of runaway prices; and with the present base from which it would start, this is not to be considered.

Continuance of Regulation will avoid Government Ownership

No thoughtful man can doubt, whether or not he believes in the extension of regulation, that great economic changes are inevitable following the war. The growth of the socialist group, heretofore mainly confined to other countries, will expand in the United States. Experiments on a gigantic scale of public control and even public operation of manufacture and commerce have been made in European countries engaged in the war and of less magnitude in

the United States. Also it has been demonstrated that in many directions, under the system of cooperation, efficiency and economy have been very greatly increased and unnecessary wastes reduced. With the mighty burden of the war debts upon us it will be absolutely necessary to continue this efficiency and economy. Therefore in advocating the continuance of the use of the principle of regulation for those fundamental commodities essential to the very life of the people or in the legal phrase vested with a public interest, I believe I am advocating the policy by which we may escape government ownership and operation.

For my part I am very reluctant to see the management of the industries of the country fall into the hands of a governmental bureaucracy. The emergency situation, due to our unpreparedness, when we entered the war, was met in large measure by the voluntary service to the government of thousands of our ablest men from business and many other walks of life. Under the extraordinary stress of the nation, incited by highly patriotic motives, they have left their private affairs and have taken positions wherever the country called. Their service is unbought. They are exerting their utmost energy for our country, and this will continue during the period of the war. But when the war ends, they will rightly return to their own affairs. They will not become a permanent part of government bureaus.

Heretofore agriculture, industry and commerce have been under the leadership of able men who have reached their positions as a result of the competition of ability. The citadel of defense of private property is that the system develops initiative and energy. These qualities give large rewards to the men possessing them. The central point at which private property is attacked is that strong men use their powers for their own ends. The captains of industry have too often exercised their control without sufficient regard to the public interest.

What I am proposing is that property remain in private hands and that exceptional initiative and energy have exceptional reward, but that so far as business and industry are vested with a public interest they be subjected to regulation. Under this plan, those who controlled vast properties would necessarily exercise that control with due consideration for the masses of the people.

We should then have both the advantages of private property and the protection of the public. Should not this plan, both for the utilities and the essential commodities vested with a public interest be thoroughly tried out before we place the control of productive industry and commerce in the hands of governmental bureaucracies?

The Extent to which Regulation should be continued

In advocating the continuance of regulation after the war, I do not mean to imply that all the existing measures shall be retained in their present forms. It is yet too early to suggest a program in regard to the extent which this should be done. What I am advocating is that we maintain the principle that the essential commodities are subject to control in the public interest precisely as are the utilities. That principle recognized, regulatory measures should be continued only as far as necessary to meet the existing world conditions. In the further development of the policy of regulation we should proceed cautiously as occasion arises precisely as we did in the control of the public utilities.

CONCLUDING STATEMENT

This World War probably will cost hundreds of thousands, and it may cost millions of our men. It will require many billions of our treasure. This will put a heavy burden upon succeeding generations. The dreadful costs of the war we must bear. Should we not therefore gain everything possible from the experiences of the war? The vast savings due to more scientific production and distribution, if continued after the war, will in large measure, indeed, they may completely, carry not only the interest load imposed upon us, but even furnish a certain amount each year toward the liquidation of the principal. Without being able to demonstrate it, I believe it probable, that if, following the war, wise governmental regulation is continued for essential commodities as well as the utilities, the savings of the people may be sufficient to meet the money cost of the war. Nothing can compensate for the losses in men.

CHARLES R. VAN HISE
UNIVERSITY OF WISCONSIN

SCIENTIFIC EVENTS

AMOS PEASLEE BROWN

RESOLUTIONS were passed at the last meeting of the faculty of the Towne Scientific School of the University of Pennsylvania on the death of Professor Amos P. Brown as follows:

WHEREAS: In the death of Amos Peaslee Brown, for many years the professor of mineralogy and geology in the Towne Scientific School, the university has lost an honored and able scholar and original investigator; the faculty of the Towne Scientific School wishes to record its sense of the loss to this faculty and to the university, and to express also its sympathy to Professor Brown's family.

Amos Peaslee Brown was born in Germantown, December 3, 1864. He graduated from the Towne Scientific School in 1886, with the degree of Bachelor of Science; he received the degree of Doctor of Philosophy in 1893. He subsequently became by advancement through various grades professor of mineralogy and geology in the University of Pennsylvania, holding this position until his retirement in the winter of 1916–17.

Dr. Brown was a man who by his fine personal character and high aims, and by his lovable disposition won warm and enduring friendships. His work while well known among scientific men did not attract publicity; he did not wish that it should, he was rather of the scholarly type which quietly, studiously and accurately pursues his chosen field. By reason of his philosophic and analytic mind, Dr. Brown was able to make specific application of his knowledge to the problems of other fields of science besides his more immediate one of the geological sciences.

His work carried him into the laboratory and field alike. He was the first geologist to visit and report on the geological formations of considerable general geological importance. He was at intervals connected with the Second Geological Survey of Pennsylvania. His papers cover a wide reach of general and specific scientific character.

Among the most notable recent investigations in America was the work done by Professor Brown in the field of crystallography; specifically the investigations in the classes of crystals found in the hemoglobins of the entire range of the vertebrate animals. In the course of this investigation Dr. Brown prepared, examined and calculated the functions of thousands of intricate and minute crystals, deducing from them conclusions highly important alike to organic and inorganic science. This work, carried out in collaboration with Professor Reichert, of this university, is one of the greatest contributions to exact science ever made in this country and is a lasting adornment to the fame of the University of Pennsylvania.

This faculty, therefore, in the realization of the loss to the entire university in the untimely death of their late colleague, passes this resolution of its appreciation of the man and of the loss to the University of Pennsylvania.

WORK OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS[1]

IN March, 1917, the committee arranged, in conjunction with the National Research Coun-

[1] From the annual report of the executive committee of the National Advisory Committee for Aeronautics.

cil, for representation on the foreign committee sent abroad by the National Research Council to obtain detailed information on scientific matters of importance in connection with the war, and Dr. Joseph S. Ames, member of this committee, was appointed such representative.

In order to further develop contact with sources of information from abroad, Lieutenant Colonel L. W. H. Rees, R. F. C., member of the British commission, together with Major Joseph Tulasne, Captain de Guiche, and Captain A. de La Grange, of the French Flying Corps and members of the French commission, were made associate members of the committee, and as such attended its meetings, contributing valuable information and suggestions regarding matters with which they were especially familiar.

Previous to the entrance of the United States into the present war the committee had undertaken a census of the production facilities of manufacturers of aircraft and aeronautic engines, which information was made available for use of the Aircraft Production Board at the beginning of its work in April.

In October, 1916, the committee took under consideration the question of the selection of a suitable site for the committee's proposed experimental laboratory. At the suggestion of the War Department this committee inspected several proposed sites and made recommendation to the War Department for the purchase of one of them, which recommendation was accepted by the War Department and the site was purchased.

On this field the War Department has allotted to the committee a space suited to the erection of the committee's proposed research laboratories. The committee has designed the first building of the group contemplated and it is now in the course of construction.

The committee has cooperated with the Aircraft Production Board in connection with a wide variety of problems relating to the design, specifications, and tests of aircraft. The committee has now in hand a most important investigation on the use of steel for airplane construction and is supervising the development of a design for construction in steel, to be later subject to a program of tests intended to show the possibilities of such type of construction.

In the field of power plant design and construction for aircraft, the committee has cooperated with the Bureau of Standards in the design, construction, equipment and operation of a large vacuum chamber engine testing laboratory which is intended to reproduce the conditions of aeronautic engines operating at high altitudes. This equipment has been installed with special reference to the development and improvement of the "Liberty" engine and important investigations bearing on this problem are now being carried forward. The committee has also carried on a number of researches on the subject of radiator design and proportion, carburetor design and adjustment, ignition apparatus, and is continuing its study of the problem of an airplane engine muffler.

The committee has undertaken important investigations relating to the development of various instruments used in the navigation of aircraft and in testing aircraft in free flight. In particular there has been developed an improved form of geographic position indicator which will be of special value in connection with certain free flight tests under consideration.

Regarding the subject of aircraft communications the committee has cooperated in the development of a generator for wireless sending from airplanes and intended to satisfy the requirements of the Army and Navy. Investigations are still being carried on regarding means for detecting hostile airplanes before they are visible or before they can be heard by the unaided ear.

On March 8, 1917, the committee took under consideration the development of methods for mapping from airplanes which should be rapid, economical, and sufficiently accurate for aviation purposes. Allotments were made for developing a new type of airplane mapping camera and gratifying progress has been made in the development of such an instrument.

Soon after the declaration of hostilities with Germany, the Chief Signal Officer called to the attention of the committee the large amount of material which was coming before the War Department comprising inventions and suggestions relating to aeronautics in warfare, and asked assistance in examining and disposing of such material. Accordingly, this committee, through an appropriate subcommittee appointed for the purpose, has acted as a board of inventions for the government in matters relating to aeronautics, and since the outbreak of hostilities between the United States and Germany it has weekly examined hundreds of suggestions and inventions pertaining to this subject. Several suggestions of value have been received and brought promptly to the attention of the particular government office most directly interested.

In December, 1916, the subject of cooperation with the Post Office Department in the establishment of aerial mail routes was considered, and the same matter in one form or another has been considered from time to time since that date.

In the latter part of 1917 the general subject of civil aerial transport was brought to the attention of the committee and a special subcommittee was appointed to take under consideration the various phases of civil and commercial uses of aeronautics with special reference to the conditions which may be expected to develop at the close of the war.

The committee has made progress during the year in the study and investigation of the following problems: Stability as determined by mathematical investigation, air-speed meters, wing sections, aeronautical engine design, radiator design, air-propeller design and efficiency, forms of airplane, radio telegraphy, noncorrosive materials, flat and cambered surfaces, terminal connections, characteristics of constructive materials, and standardization of specifications for materials.

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

THE fifteenth annual geological excursion of the New England colleges and universities was held on Friday, October 12, and Saturday, October 13, under the leadership of Professor J. B. Woodworth, of Harvard University, and Dr. Edward Wigglesworth, of the Boston Society of Natural History. Owing to the unusual conditions universally prevailing this year, the only colleges represented, aside from Harvard, were Mount Holyoke and Williams.

The excursion consisted of a trip to the island of Marthas Vineyard, including on the way a hurried visit to the white cedar "submerged" bog north of Woods Hole, where the question of coastal movements was discussed. On Friday afternoon, automobiles conveyed the party over the outwash glacial plain to the Weyquobsque cliffs, where the succession of the Cretaceous clays and the Miocene and Pleistocene sands and gravels was studied, as well as the rapid work of the waves in cutting back the cliffs. Spits and bars, built by the alongshore currents, were well seen from the uplands.

Saturday morning was spent at the Gay Head cliffs, studying the section of clays, sands, and boulder beds ranging from the Cretaceous to the Pleistocene, complicated by faulting and the crumpling and overthrust folding of the clays and gravels under the overriding ice of the Glacial Period. The afternoon was spent studying the so-called "morainal topography" to the northeast of Gay Head, a topography most of whose features seem to be due, primarily, to erosion during Vineyard interglacial time, deposits of Wisconsin age forming only a thin veneer on the surface of the preexisting land-forms, and carrying with them, in places, many large boulders.

In recording the appreciation of the members of the party of the care taken by the leaders to make every feature of the trip, even including the weather, a great success, the opening words of the announcement sent out before the excursion may well be repeated, "Motto: 'Go (with them) and see!'"

MEDICAL WORK OF THE UNIVERSITY OF CINCINNATI

ON the first of January a new charter went into effect in Cincinnati, which places all of the medical, scientific and nursing work in

the new city hospital under the direction of the University of Cincinnati. The charter provides that the medical director of each department shall be the professor in the corresponding department of the medical college and that the board constituted of these directors shall nominate to the board, through the president, all members of the staff of the hosiptal, including the superintendent, who shall be the general executive and business manager of the hospital. This superintendent will select all the other employees under the rules of the Civil Service Commission of the city. The charter thus removes the hospital entirely from the sphere of politics, places all the medical, scientific and nursing work under the direction of the medical college, and secures all the facilities of the hospital for the purposes of education and research. The plans for the hospital were made by Dr. Christian R. Holmes, dean of the medical faculty, and the whole building scheme has been worked out to conform to these plans.

The new building of the medical college, situated upon a twelve-acre lot immediately across the street from the hospital, has just been completed and occupied. This gives Cincinnati a complete medical teaching and research plant, costing over $5,000,000. The medical college is a regular department of the university, which pays all its expenses. The city will continue to pay the general operating expenses of the hospital, such as the heating and lighting, food, engineers, janitors, etc., while the university will pay all the expenses of the medical, surgical, scientific and nursing service. The total expenses to the city of operating the combined medical college and hospital plant will be, not including income on endowments, approximately $700,000 a year.

The same charter provides for a reorganization of the board of directors of the university, who will now be appointed, one each year, to serve for nine years. The newly elected mayor has just announced the reappointment of the former board, which has managed the affairs of the university so successfully in recent times. Its members are: Judge R. B. Smith, chairman, Mr. O. J. Renner, Dr. D. I. Wolfstein, Mr. Stanford Brown, Dr. W. R. Griess, Mr. Robert W. Hochstetter, Mr. A. R. Morgan, Mr. Emil Pollak, and Dr. E. O. Straehley. This is the second time that the members of the board have been reappointed, much to the gratification of the friends of the university. For the reappointment of faithful and experienced men gives a stability to the institution and creates a confidence in the administration which is bearing fine fruits in gifts of endowment. The Baldwin estate, amounting to over $800,000, will be turned over to the university this month.

DESTRUCTION BY FIRE OF SCIENTIFIC LABORATORIES

Mount Holyoke College lost by fire on December 22 Lyman Williston Hall, the oldest of its science laboratories. The building housed the departments of botany, geology, psychology, physiology and zoology. The loss to the college is practically complete and is estimated at more than $100,000. It includes the museums of botany, zoology and geology, the last especially rich in the dinosaur footprints of the Connecticut Valley and the laboratory equipments and libraries of all the departments mentioned. In several instances members of the faculty lost their entire private collections and working libraries as well as the results of prolonged research work. Plans are already begun for temporary quarters and such material and equipment as can be replaced will be secured as fast as possible, so that even at this season of difficult purchase the college work in the sciences concerned may go on without serious interference. If other institutions or private individuals have duplicate museum material, microscopic slides which they do not need, extra laboratory equipment difficult to procure at this time, or duplicates of out-of-print books, the heads of the various departments will be glad to learn of this in order to arrange for loan or purchase. In particular, those who have sent reprints to Mount Holyoke before may be helpful by repeating their courtesy, if possible, since much time will be needed to replace files of periodicals. Dr. Cornelia M. Clapp, for many years head of the department of zoology and physiology,

had deposited her large collection of reprints in the department library now completely destroyed. Those to whom correspondence should be addressed are Alma G. Stokey, botany department; Mignon Talbot, geology department; Samuel P. Hayes, psychology department; Abby H. Turner, physiology department; Ann H. Morgan, zoology department, Mount Holyoke College, South Hadley, Massachusetts.

THE main laboratory of the United States Fisheries Biological Station at Fairport, Iowa, was destroyed by fire in the early morning of December 20, only the office furniture and records being saved.

That station is the center of most of the scientific work of the Bureau of Fisheries in the Mississippi Basin, combining the functions of mussel propagation and fishery investigation and experimental work. It is the only station of the bureau equipped and employed for continuous fish-cultural experiment work. Fortunately, the water supply, the large series of ponds, and the smaller buildings are unharmed, and many phases of the work will continue without interruption. Nevertheless, the loss of the laboratory, with its excellent equipment for biological and chemical studies, will serve to retard some investigations of immediate importance to the best utilization of the products of fresh waters.

Not the least significant loss was the library which, though not large, had been assembled with much care. It comprised many rare books and a large number of separate pamphlets contributed by authors or gleaned from the second-hand book stores of America and Europe. Many of these can not be replaced.

As steps are now being taken looking to the prompt restoration of all facilities for investigation, the cooperation of authors is particularly invited. Those having separates relating to the subjects of fresh-water biology, ecology, limnology, biochemistry and the chemistry of foods will render a valuable service by forwarding papers to the station or the Commissioner of Fisheries, Washington, D. C.

SCIENTIFIC NOTES AND NEWS

THE officers elected at the Pittsburgh meeting of the American Association for the Advancement of Science are given in the account of the meeting published elsewhere in the present issue of SCIENCE. Professor John M. Coulter, of the University of Chicago, the newly elected president of the association, was also elected president of the American Association of University Professors.

PROFESSOR WILDER D. BANCROFT, of the department of chemistry of Cornell University, is in Washington, serving as technical adviser in the U. S. Bureau of Mines.

ASSISTANT PROFESSOR P. W. BRIDGMAN has received leave of absence from Harvard University to join Professor G. W. Pierce at the submarine base in New London, where both will experiment on wireless problems.

DR. BASHFORD DEAN, of the American Museum of Natural History, has been assigned the rank of major in the United States Army and is at present in Europe.

DR. THOMAS DARLINGTON, formerly health commissioner of the city of New York, has been called to Halifax by the relief committee to act in an advisory capacity regarding the sanitation and housing in the reconstruction of the devastated areas.

IN recognition of his contributions to science, Colonel Theodore Roosevelt has been appointed honorary fellow of the American Museum of Natural History, of which his father, Theodore Roosevelt, Sr., was one of the founders and most energetic supporters.

THE Société de Pathologie Exotique, of Paris, has elected Charles A. Kofoid, professor of zoology, University of California, as corresponding member.

AT its fifth annual meeting in New York on January 18 the National Institute on Social Science will present medals for "notable service to mankind" to Herbert C. Hoover, Food Administrator; Henry P. Davison, chairman of the Red Cross War Council, and Dr. William J. Mayo, the surgeon.

ON the recommendation of Surgeon-General Bradley, General Pershing has appointed a

committee to study hospital conditions, surgical treatment and sanitary medicine in Italy. The committee consisted of the following members: Majors Angus McLean, George E. McKean and Harry N. Torrey. Lieutenant Bror H. Larsson accompanies the expedition as secretary, and Captain James W. Inches represents the American Red Cross. Permission for this investigation was obtained through the Italian military authorities, and was granted for fourteen days.

Dr. Joel Asaph Allen, after twenty-eight years of active service as editor of the scientific publications of the American Museum of Natural History, has resigned in order to devote his entire time to the collections of the department of mammalogy and ornithology, of which he is curator. The following is an extract from the resolution passed by the publication committee of the museum in appreciation of Dr. Allen's services:

> . . . As the scientific editor, he has been little less than ideal, since with a natural fitness for the calling there was combined also the highest quality of scholarship in the subjects dealt with by his contributors. He was thus more than editor; rather a leader in the researches represented in the *Bulletin* and *Memoir* series.

Dr. F. E. Lutz, of the department of invertebrate zoology has been appointed to suceed Dr. Allen.

At the recent meeting of the American Association of Anatomists, held in the new Institute of Anatomy at the University of Minnesota, Minneapolis, the following officers were elected: *President,* Professor R. R. Bensley, of the University of Chicago; *Vice-president,* Professor C. R. Bardeen, of the University of Wisconsin; *Secretary-Treasurer,* Professor C. R. Stockard, of Cornell University; *Members of the Executive Committee,* Dr. G. L. Streeter, Carnegie Institution, Professor G. S. Huntington, Columbia University, and Professor H. E. Jordan, University of Virginia.

The following officers have been elected by the Association of American Geographers for 1918: *President,* Nevin M. Fenneman; *First Vice-President,* Charles R. Dryer; *Second Vice-President,* Bailey Willis; *Secretary,* Oliver L. Fassig; *Councilor,* Walter S. Tower; *Treasurer,* François E. Matthes.

The British Air Inventions Committee appointed by Lord Cowdray, the late president of the Air Board, consists of the following members: Mr. Horace Darwin, F.R.S., chairman, Major-General Luck, vice-chairman, Sir Dugald Clerk, F.R.S., Sir Richard Glazebrook, F.R.S., Professor H. L. Callendar, F.R.S., Professor C. H. Lees, F.R.S., Professor J. E. Petavel, F.R.S., Mr. L. Bairstow, F.R.S., Lieutenant-Commander Wimperis, Major G. Taylor, Captain B. M. Jones, Captain A. V. Hill, Munitions Inventions Department, Mr. J. P. Millington and Mr. F. W. Lanchester. The main function of the committee is to investigate inventions submitted to it.

The next lecture of the Harvey Society will be given on Saturday evening, January 12, at the New York Academy of Medicine, on "Food Chemistry in the Service of Human Nutrition," by Dr. H. C. Sherman, professor of food chemistry in Columbia University.

At University College, on December 18, Major Sir Filippo de Filippi delivered a public lecture, illustrated by lantern slides, on the sanitary services of the Italian army.

At the meeting of the Royal Statistical Society on December 18, Sir R. Henry Rew read a paper on the prospects of the world's food supplies after the war.

UNIVERSITY AND EDUCATIONAL NEWS

By the will of Zenas Crane, late of Dalton, Mass., public bequests of more than $500,000 are made to various institutions, including $200,000 to the Berkshire Museum of Natural History and Art of Pittsfield; and $5,000 each to Washburn College, Topeka, Kans.; Yankton College, Yankton, S. D.; Idaho Industrial Institute, Weiser, Idaho; Lincoln Memorial University, Cumberland Gap, Tenn.; Oberlin College, Oberlin, Ohio; Berea College, Berea, Ky.; Tuskegee Normal School, Tuskegee, Ala.; Hampton Normal and Industrial School, Hampton, Va.

UNDER the will of Evelyn MacCurdy Salisbury, of New Haven, widow of the late Professor Edward E. Salisbury, Yale University is to receive the sum of fifty thousand dollars to found a professorship to be called the Charles J. MacCurdy professorship of anthropology, on condition that the university pay to George Grant MacCurdy the sum of twenty-five hundred dollars annually during his lifetime. The will also provides for a conditional annual gift of fifteen hundred dollars to be expended at the discretion of Professor MacCurdy for the benefit of the anthropological department of the Yale Museum. Another provision is that upon the decease of George Grant MacCurdy the sum of sixty thousand dollars is to be paid to either (1) Yale University to found a research fund to be called the Evelyn MacCurdy Salisbury Research Fund in Anthropology; or (2) the Connecticut College for Women at New London to found a professorship of American history as George Grant MacCurdy shall designate by his last will; a power of apportionment as between these two institutions being conferred upon him.

MRS. KING, of Worthing, has given £1,000 five per cent. war stock for the establishment in the University of Cambridge of a scholarship for research work on fevers, in memory of her daughter, Neita King, a member of a voluntary aid detachment who died of cerebro-spinal fever in France last May.

THE Harvard University registration is 3,684, nearly 2,000 less than last year. The Law School shows the greatest decrease, its figures of 856 last year dropping to 296 this year. Two departments show an increased attendance, the Medical School, with an enrolment of 386, a gain of 28 over last year, and the engineering and mining department, with 591, an increase of 14.

WILLIAM M. DAVIS, Sturgis Hooper professor of geology, emeritus at Harvard University, has asked to be relieved of his position as western exchange professor, and his resignation has been accepted.

CHARLES FULLER BAKER, assistant director of the Botanic Gardens at Singapore, and professor of agronomy (on leave) at the College of Agriculture of the Philippines, has been recalled to the Philippines to assume the deanship of the College of Agriculture and the professorship of tropical agronomy due to the mid-year retirement of Dean Copeland.

DISCUSSION AND CORRESPONDENCE

GEOLOGIC DATES IN PHYSIOGRAPHIC DESCRIPTIONS

THE protest repeatedly urged by Davis[1] against the unwarranted introduction of formation names and other irrelevant geologic material into geographic descriptions is, no doubt, heartily seconded by the majority of geographers and physiographers.

A good thing may, however, be carried too far.

A case in point, as it appears to the writer, is a description by C. A. Cotton of "Block Mountains in New Zealand," which appeared in a recent number of the *American Journal of Science*.[2]

Cotton's paper is a most commendable example of a physiographic description worked out along the lines advocated by Davis. The material is most effectively presented, but, in accordance with Davis's suggestions, all mention of geologic age, or dates, either of the block faulting movements or of the formations involved, is deliberately and studiously avoided.

This may be desirable from the standpoint of a geographer whose sole interest is in the present landscape, but his geological colleagues are sure to find it disappointing.

The science of geomorphology has now reached such a stage that it has an interpretative as well as a descriptive value. Geologists are coming more and more to rely upon physiographic evidence in interpreting recent earth history. Why, then, should a

[1] Annals Assn. Amer. Geogr., Vol. V., 1915, p. 90.

[2] Cotton, C. A., "Block Mountains in New Zealand," *Am. Jour. Sci.*, 4th Ser., Vol. XLIV., 1917, pp. 249–293.

physiographic contribution of so great possible interpretative value as "Block Mountains in New Zealand" be rendered almost useless to the student of earth history by the deliberate omission of all reference to geologic dates? Surely the incidental mention of the geologic age of the weak over-mass described by Cotton, and of any other events whose geologic dating may have been known, would not have impaired the geographic value of the paper.

By all means let us eliminate unnecessary and irrelevant geologic detail from geographic or physiographic descriptions, but let us not go to the extreme of rendering our geomorphologic studies valueless for their important interpretative functions.

John L. Rich

University of Illinois

REMOVING INSECTS FROM GREENHOUSE PLANTS WITHOUT SPRAYING AND WITHOUT INJURY TO THE PLANTS

When one is running experiments in the greenhouse and the plants become infested with insects, the disposal of the pests becomes an important question. This question becomes all the more important if the nature of the investigation will not permit the plants to be sprayed. The writers were recently faced with such a problem and solved it by using an apparatus working on the principle of a vacuum cleaner.

A flask was fitted with connections similar to those of a wash bottle, the mouthpiece being connected with a suction pump by a piece of tubing sufficiently long to allow the flask to be moved to any point desired. The nozzle was extended to a point parallel with the bottom of the flask and the opening made sufficiently small to just allow the desired insects to pass readily. By putting a small amount of oil in the flask, for an insecticide, closing the connections and turning on the pump, the apparatus was ready for use. Small plants that were thickly covered with aphids and red spiders were quickly cleaned. Ants and other insects were also readily taken up. It is possible that this apparatus may be modified to meet many requirements by simply changing the size and shape of the nozzle, and by using various kinds of motors and pumps.

Paul Emerson,
J. B. S. Norton

Maryland Agricultural Experiment Station,
College Park, Md.

SCIENTIFIC BOOKS

The Electron, Its Isolation and Measurement and the Determination of Some of Its Properties. By R. A. Millikan. University of Chicago Press.

This volume of 260 pages contains an account of the work on the exact determination of the electronic charge and allied subjects done by Professor Millikan and his pupils during the last ten years. It also contains an account of the earlier researches which led up to Millikan's work, and besides a short discussion of recent views on the electron theory of matter and the theory of radiation to which Millikan's exact investigations have added precision in several important ways.

The book is intended for the general reader as well as for the physicist and it will be read by both with immense enjoyment and instruction. It is written clearly and concisely and is full of most interesting and important information.

The only criticsm the writer of this review has to make is that the concluding chapters are too short; they contain so much that is interesting and suggestive that one can not help wishing the writer had found time to make them as full of detail as some of the earlier chapters.

Millikan's beautiful investigations on the electronic charge and on the photo-electric effect are justly celebrated throughout the scientific world; they will undoubtedly become classical examples of the highest type of modern physical research. A description of such researches by their author is immensely valuable and will serve to stimulate scientific investigation as nothing else can.

Every student of physics, and especially every graduate student, should obtain this book and study it thoroughly and then en-

deavor to imitate the author's infinite capacity for taking pains to overcome every difficulty and eliminate every source of error. By such work modern science is placed on a sure foundation, and besides new avenues of research are opened up. It is a mistake to suppose that investigations of high precision do not lead to new discoveries. Lord Rayleigh's exact measurements of the densities of the common gases resulted in the discovery of argon, and many similar examples could be given. It would be truer to say that inexact work often leads to discoveries being missed which ought to have been made and besides rough work generally leads to erroneous conclusions which others have to waste valuable time and energy setting right. Millikan, for example, has had to spend considerable time setting right the erroneous conclusions of Ehrenhaft on the existence of a "sub-electron," conclusions which ought never to have been drawn.

Millikan's new book is admirably printed and illustrated and seems very free from typographical errors. It is dedicated to Michelson and Ryerson and forms a record of work worthy of the inspiration of the former and the generosity of the latter. H. A. W.

MINERALS OF JAPAN

VALUABLE service has been rendered to mineralogy by Dr. Wada in his editorship of the "Beiträge zur Mineralogie von Japan," the articles in which, in spite of the German title, have been almost all in English. The latest issue[1] contains two articles on the minerals of Korea by Nobuyo Fukuchi, describing specimens of sixty different minerals (pp. 207–228). Other papers treat of prismatic sulphur from Formosa, by Masakichi Suzuki; the optical properties of danburite from Bungo Province, Japan, by Mikio Kawamura; epidote crystals from Iwaki Province, by Kinzô Nakashîma; ferberite from Kai Province and hübnerite from Shimotsuke Providence, by Kotora Jümbô. A paper of special interest is that on the aragonite cones formed at the Kurujama Geysers, in Yuzawa, Shimotsuke Province, Japan. A cone 30 cm. in height was formed by the hot water of one of the geysers in a period of ten months.

In his work on "The Minerals of Japan," Dr. Tsunashirô Wada[2] gives in concise and systematic form characterizations of the various mineral forms that had been observed in Japan up to the date of his treatise. His thorough training in European methods added to his familiarity with the geology of his native land make this book a trustworthy source of information. The crystallographic details are quite fully given and constitute one of the most valuable features of the work for the mineralogical student.

As to the metals of Japan, Dr. Wada notes that the richest gold deposits are those on the island of Formosa (p. 12), the chief localities being Zucho Kinkwaseki near Taihoku, in the northeastern part of the island. Quartz veins traversing a volcanic rock are sometimes found bearing a large quantity of native gold. Frequently the yellow surface has a coating of limonite formed by the decomposition of pyrites. There are also alluvial gold deposits in Formosa. In Japan proper the rich placers in the Hokkaido are extensively worked; one crystal from the mining district of Esashi measured 6–10 mm. along the edges of its octahedron. The largest nugget was found in 1900 at the Usotannai in Esashi; it weighed 769.2 grams (2 pounds 15 2/3 dwts. Troy), the dimensions being $106 \times 63 \times 25$ mm. (p. 13) and the intrinsic value about $500. The oldest known gold mine in Japan is that of Sado.

As in many parts of the world, platinum is found in association with gold in Japan, for example in the Yubari-gawa and Pechan rivers in the Hokkaido, and it occurs with gold and iron sands in Nishi-Mikawa. Copper and silver are also met with in a number of localities, but crystallized silver has never been found in Japan.

Of the ornamental or gem stones the ame-

[1] "Beiträge zur Mineralogie von Japan," ed. by T. Wada, No. 5, November, Tôkyô, 1915 (pp. 207–305 of the series, one plate).

[2] Tsunashirô Wada, "Minerals of Japan," transl. by Takudzi Ogawa, Tôkyô, 1904, vii + 144 pp., 30 pls., 8vo.

thyst of Fujiya, Hoki Province, must be noted, and rose quartz is found at Gota. Maki Province (pp. 46, 47). Inclusions of quartz come chiefly from Mukaiyama and Takemori, the green fibrous inclusions being epidote and the brown fibrous ones tourmaline; included sulphur of a beautiful yellow is limited to quartz of Takemori. Fluid inclusions are quite common, being usually distributed irregularly throughout the crystal, though sometimes in definite layers parallel to the faces of the rhombohedron (p. 44). Felspar, tourmaline and garnet are here found in association with quartz. Localities well known since ancient times for beautiful quartz crystals are the granitic regions around Kimpû-zan, Kai Province. Here colorless and transparent crystals for ornamental work have been obtained for centuries (p. 38). It is well known that the manufacture of beautiful crystal balls has long been carried on in Japan.

A small crystal of crysoberyl has been found in stanniferous sand of Takayama, Mino Province; it was of a pale greenish-yellow color (p. 82). Beautiful crystals of vivianite were at one time met with at Ashio, Shimotsuke Province. At first they were light blue, but became darker on exposure to the air (p. 86). Some blue, transparent crystals of tourmaline have been found at Takayama, Mino Province, and beryl found here resembles the tourmaline in color and form, one end of the crystal being of a lighter hue, while the other end is decidedly darker and only semi-transparent. The topaz, however, is the most conspicuous of the gems found in Japan and Dr. Wada gives a very full account both of the occurrences and of the crystallographic forms (pp. 89–113). It occurs in pegmatite veins in granite as in Takayama and Hosokute, Mino Province, Ishigure, Ise Province, and Tanokamiyama, Omi Province. Japanese topazes were first exhibited in the National Exposition of Tokio in 1877. Six different hues have been observed, as follows: (1) Colorless; (2) wine-yellow, or bluish-yellow; (3) pale blue; (4) pale brown and pale blue in sectors; (5) pale green; (6) brown. On exposure to daylight the brown and brownish-yellow shade into blue, and the blue tends to become colorless. The brown hue is confined to a few freshly-quarried specimens, and is never observable in those which have been kept long in daylight. In some specimens the structure is shown by inclusions arranged parallel to the outline of the crystals, producing the strange effect observable in the so-called "phantom quartz."

The most beautiful of the topaz crystals illustrated by Dr. Wada (Plate XXIV., Fig. *a*) was found between 1870 and 1880. It came later into the possession of Count K. Inowe who presented it to Dr. Wada. It measures 84 mm. in length, 64 mm. in the longer diameter and 51 mm. in the shorter. It is based on a piece of felspar, and on the side is black quartz crystal, the topaz standing nearly perpendicular to its prismatic faces.

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SPECIAL ARTICLES

THE GEOMETRICAL MEAN AS A B. COLI INDEX

Several reasonable objections have dissatisfied bacteriologists with the present methods of estimating the average number of *B. coli* in water.[1] The following method is proposed as a simple, convenient, and theoretically desirable means of arriving at a numerical index representing such a series of results. It was suggested in 1912 by data obtained at the Washington Filter Plant,[2] and has since been practically applied with much success.

Data—B. coli are determined to be present or absent in a series of fermentation tubes containing portions of the sample in multiples of ten, *i. e.*, 10 c.c., 1 c.c., .1 c.c., .01 c.c., .001c.c., etc.

Example: Suppose twenty samples or series of tubes gave the following results, where + or positive means *B. coli* were found present,

[1] Report of the Committee on Standard Methods, American Public Health Association, 1916.

[2] Wells, W. F., "Some Notes on the Use of Alum in Connection with Slow Sand Filtration at Washington, D. C.," Proceedings of American Water Works Association, 1913.

and conversely — or negative means *B. coli* were not found.

10 C.c.	1 C.c.	.1 C.c.	.01 C.c.	.001 C.c.
20+	18+	8+	1+	0+
0−	2−	12−	19−	20−

Problem.—The problem is to derive from a number of such determinations a numerical index of the most probable result to be obtained by repetition.

Definition.—Call the quantities used "Dilutions," since the dilution method is the one used for measuring those quantities. Specifically grade the dilutions as follows:

Quantity..	10 c.c.	1 c.c.	.1 c.c.	.01 c.c.	.001 c.c.,	etc.
Dilution ...	0	1	2	3	4	, etc.

Call the "Dilution Positive" that "Dilution" at which higher "Dilutions" were negative and lower positive, after reverting skips where such occur.

Example continued:

"Dilution	0	1	2	3	4
Positive" ...	2	10	7	1	0

Average Dilution Positive.—Add the "Dilutions Positive," and divide by the number of samples to find the "Average Dilution Positive."

Example continued:

"Dilution Positive"

0 × 2 = 0
1 × 10 = 10
2 × 7 = 14
3 × 1 = 3
4 × 0 = 0

Total 20) 27

Average 1.35

Score.—The decimal part of the "Average Dilution Positive" gives the "Score," and the integral part tells how many figures to point off. The reason for calling it a "Score" is that it is directly comparable to the bacteriological score of oysters.[1] In the above example, the "Score" would be 3.5. For all ordinary purposes, the "Score" is a very good index and can be used directly.

Geometrical Mean.—The "Score" can be converted into the "Geometrical Mean" from the following table:

TABLE FOR CONVERTING SCORE INTO GEOMETRICAL MEAN

	0	1	2	3	4	5	6	7	8	9
0	100	102	105	107	110	112	115	118	120	123
1	126	129	132	135	138	141	145	148	151	155
2	159	162	166	170	174	178	182	186	191	195
3	200	205	209	214	219	224	229	235	240	246
4	251	257	263	269	276	282	289	295	302	309
5	317	324	331	339	347	355	363	372	381	389
6	398	407	417	427	437	447	457	468	479	490
7	501	513	525	537	550	562	576	589	603	617
8	631	646	661	676	692	709	725	741	759	776
9	794	813	832	851	871	891	912	933	955	977

From the previous example, the "Score" 3.5 becomes "Geometrical Mean" 2. 24, which is not very different. Either represents an approximation sufficiently close to be considered the number of *B. coli* per c.c.

Percentage Method.—The same results are given by an alternative method, which may sometimes be more convenient. Compute the percentages that are positive in each "Dilution." The resulting figures should extend from a "Dilution" at which 100 per cent. are positive to one at which 10⁰ per cent. are negative. The percentages are then added, and will give a number of three figures before the decimal point. The first or hundreds figure is discarded, the other figures giving the "Score" when properly pointed off by inspection.

Example continued:

Quantity		Per Cent. +
10	c.c.	100
1	c.c.	90
.1	c.c.	40
.01	c.c.	5
.001	c.c.	0
		235

Discarding the 2 gives the "Score" figures of 35. Inspection shows there are more than .35 and less than 35, and thus the same result, 3.5, is obtained as by the previous method.

Reversion Method. (*a*) *Direct.*—The principle of reversion used in figuring the oyster score[1] may also be applied in this method.

Example continued: The + .01 c.c. tube and one of the + .1 c.c. tubes revert to the 1 c.c. column, leaving seven + .1 c.c. tubes out of twenty samples. This gives 35 per cent. of the .1 c.c. tubes positive or as before the "Score" 3.5 when pointed off.

(*b*) *Percentage.* The same thing may be done from the percentage column above, *i. e.*, 5 per cent. of the .01 c.c. and 5 per cent. of the .1 c.c. tubes revert to make the 90 per cent. of the 1 c.c. tubes up to 100 per cent., leaving 35 per cent. of the .1 c.c. tubes positive as before.

Single Dilution Method.—Frequently determinations are made in one dilution only. In this case the "Percentage Positive" gives the "Score" as where several are used.

Split Dilutions.—Where other "Dilutions" are used than the regular ones, the same methods can be applied by using the corresponding "Dilution" in the computation.

CONCLUSION ARGUMENT

The reason the above simple methods give the "Geometrical Mean" arises from the fact that the ordinary bacteriological dilution scale is in reality a logarithmic scale, and the average dilution is the average logarithm or the logarithm of the "Geometrical Mean." A vast amount of published bacteriological data to be considered at some other time proves that bacteriological results follow a logarithmic probability curve, from which it follows that the median value closely corresponds to the geometrical mean. It is equally probable, therefore that another sample would be greater as less than the geometrical mean. There is nothing in this principle to limit the application of the method, and by intelligent application it can be employed in interpreting all similar forms of data.

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PITTSBURGH MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The seventieth meeting of the American Association for the Advancement of Science was held in Pittsburgh, Pennsylvania, on December 28, 1917, to January 3, 1918. It seems to be a very general opinion of the members who attended that the meeting was practically an unqualified success. The total registration at the office of the permanent secretary was 692.

It is impossible to estimate the number of members who were deterred from attendance by the statement sent to the press by the Pennsylvania Railroad late in December, and by the published letter of Dr. Richards, but it is obvious that no congestion of traffic, and no clogging of trains resulted from the meeting. Of the 692 persons registered, 194 came from Pittsburgh and other parts of Pennsylvania, 122 registering from Pittsburgh alone. The remaining attendance came as usual from all points of the compass, and were distributed on the regular trains arriving at different times, so that their train presence was scarcely to be noticed.

The attendance was distributed as follows: from Pittsburgh and the rest of Pennsylvania, as just stated, 194, New York 84, Ohio 59, District of Columbia 44, Illinois 34, Massachusetts 26, West Virginia 21, Indiana 20, Michigan 18, Wisconsin 15, Maryland, Missouri and Canada 14 each, Iowa and Texas 13 each, New Jersey and Virginia 11 each, California 10, North Carolina 8, Connecticut, Tennessee and Kansas 6 each, Minnesota and Arizona 5 each, New Hampshire, Louisiana and Montana 4 each, Maine, Delaware and Kentucky 3 each, Japan, Nebraska, Utah, Oregon and Colorado 2 each, Rhode Island, Georgia, North Dakota, Arkansas and Wyoming 1 each.

The interest of the meeting was enhanced by the presence of the following foreigners, who were made honorary associates for the meeting: Lieutenant Georgia Abbetti, of the Italian Military Commission; Lieutenant G. P. Thompson, of the Royal Flying Corps of Great Britain; Captain DeGuiche, of the French Military Commission, and Dr. Shigetaro Kawasaki, chief geologist of Korea.

The impressive keynote of the whole meeting was war preparation and efficiency. This was borne out not only in a number of symposia devoted to specific war topics, but also in other discussions, and in other papers, the titles of which would not necessarily lead one to expect a development along the line of war preparation. The local press was keen in noticing this aspect of the meeting, and paid great attention to the papers of the entire session.

The opening general session of the association was held Friday night, December 28, in the lecture hall of the Carnegie Institution. The president of the Association, Professor Theodore W. Richards, of Harvard University, was absent, and Dr. George H. Perkins, of the University of Vermont, senior vice-president, presided. Mr. H. M. Irons, city at-

torney of Pittsburgh, gave an address of welcome on behalf of the mayor of Pittsburgh, to which Dr. Perkins replied.

The permanent secretary, under instructions from the council, proposed the following amendments to the constitution, which were adopted unanimously:

1. To amend Article 22 of the constitution by omitting after the word "*chemistry*" in the second line, the words "*including its application to agriculture and the arts.*" The article as amended will read:

Sections and Sub-sections

Art. 22. The Association shall be divided into sections, viz: A—Mathematics and Astronomy; B—Physics; C—Chemistry; D—Engineering; E—Geology and Geography; F—Zoology; G—," etc.

2. To amend Article 9 of the constitution by adding in line 8, after the words "*Permanent Secretary*" the words "*and the secretaries of the Sections.*"

(*Note.*—The effect of the above will be to make secretaries eligible for reelection.) The Article as amended will then read:

"*Art. 9.* The officers of the association shall be elected by balloting by the General Committee from the fellows and shall consist of a president, a vice-president from each section, a permanent secretary, a treasurer, and a secretary from each section; that is, with the exception of the permanent secretary, the treasurer and the secretaries of the sections, shall be elected at each meeting for the following one and, with the exception of the treasurer and the permanent secretary *and the secretaries of the sections,* shall not be reelected for the next two meetings. The term of office of the permanent secretary and of the treasurer and of the secretaries of the sections shall be five years."

Dr. W. J. Holland, chairman of the local committee, made certain announcements, after which Dr. C. R. Van Hise, retiring president of the association, gave his address, which had for its title "Some Economic Aspects of the World War," and in this able and strong address President Van Hise set the note for the entire meeting.

This was followed by a reception in the foyer of the Carnegie Institution by the members of the local committee and their wives.

Certain special items on the program of the week may be especially mentioned on account of their war bearing.

Section C held a symposium on "Education in Chemical Engineering."

Section M held an important symposium on "Factors concerned in an Increased Agricultural Production."

Section I listened to a paper by Hon. John Barrett on "The War and the New Pan-America," and before this same section, Howard E. Coffin, president of the Aircraft Board at Washington, spoke on the subject of "General Standardization."

Section B held a general interest session on the subject of "Relationship of Physics to the War."

Section G with the Botanical Society of America and the American Phytopathological Society, held a joint session on "War Problems in Botany."

Dr. Vernon L. Kellogg, formerly of the Belgium Relief Commission, and now with Mr. Hoover's board in Washington, gave an exceedingly strong address before the Entomological Society of America on "The Biological Aspects of the War."

Section I held a special symposium on "War Problems."

Section F held a symposium on "Contributions of Zoology to Human Welfare," in which many war problems were discussed.

Section K held a very important symposium which was packed to the doors, on the subject of "Medical Problems of the War." This symposium included an address by Lieutenant George Loewy, of the French Army, on "The Treatment of War Wounds by the Carrel Method," which was illustrated by moving pictures.

The School Garden Association of America held a symposium on "Organization of War Gardens."

The Association of Economic Entomologists discussed the two following topics at length: "Insects and Camp Sanitation," and "How the Entomologist can assist in increasing Food Production."

The Botanical Society of America, and the American Phytopathological Society held a symposium on "Phytopathology in relation to War Service."

Many of these papers will be published in subsequent issues of this journal, and abstracts of many more will also appear.

The affiliated societies meeting with the association at Pittsburgh were as follows: American Federation of Teachers of Mathematical and Natural Sciences, American Physical Society, Optical Society of America, American Electrochemical Society, Society for the Promotion of Engineering Education, Paleontological Society of America, American Society of Naturalists, Entomological Society of America, American Association of Economic Entomologists, Ecological Society of America, Wilson Ornithological Club, Botanical Society of America, American Phytopathological Society, American Society for Horticultural Science, American Fern Society, American Microscopical Society, American Psychological Association, American Metric Association, American Nature Study

Society, The School Garden Association of America, Society of American Foresters, Society of the Sigma Xi, Gamma Alpha Graduate Scientific Fraternity, Phi Kappa Phi Fraternity.

The local arrangements for the meeting had been made in a very efficient manner by the local committee, of which Dr. W. J. Holland, of the Carnegie Museum, was chairman, and Dr. S. B. Linhart, of the University of Pittsburgh, was secretary. All the meetings were held in the buildings of the University of Pittsburgh, The Carnegie Institute of Technology and the Carnegie Institute.

The council of the association took action as follows:

1. *Resolved* that the revision of the constitution be not pushed at this time—a report published.
2. *Resolved* that the dues of those members in active service in the army and navy be remitted for the period of the war when the member in question makes specific request in his own case.
3. *Resolved* that the editorial control of the journal SCIENCE be placed in the charge of an editorial committee to be named by the committee on policy.
4. *Resolved* that the necessary arrangements can be made at the Post Office Department so that the journal may be sent to the front in Europe by members who desire to do so.
5. Messrs. H. B. Ward, H. C. Cowles and Stewart Paton were elected members of the council.
6. The following were made life members emeritus under the terms of the Jane M. Smith Fund: C. H. Fernald, R. H. Richards, Marshall Calkins and T. J. W. Burgess.
7. Two hundred and seventy-eight fellows were elected from the nominations by especially appointed representatives of the sections who have scrutinized the manuscript list at Washington.
8. *Resolved* that until the next annual meeting, all business of the association be referred to the Committee on Policy with power to act.
9. *Resolved* that the president of the association be requested to appoint a committee of five fellows to cooperate with a similar committee of the Association of University Professors, and with other similar associations in the consideration of methods for the publication in this country of bibliographies progress-reports and abstracts.
10. On motion, the council instructed the permanent secretary to carry into effect the following points at future annual meetings: (*a*) The meeting places for sections and societies having been once printed, should not be changed. (*b*) Meeting places for allied interests and societies should be placed as close together as possible. (*c*) The entire number of meeting places should be grouped as closely as possible. (*d*) Authorizing the printing of detailed advice to Local Committee for individual distribution to members of such committee.
11. Messrs. Stewart Paton, H. L. Fairchild and H. B. Ward were elected members of the committee on policy.
12. The permanent secretary was granted the authority to purchase a new electric addressograph for his office.
13. The salary of the assistant secretary, Mr. F. S. Hazard, was raised to $2,100 per annum, beginning with January 1, 1918.
14. The council endorsed the following resolution coming from Section F: "It is important that in any plans formulated or encouraged by the American Association for the Advancement of Science looking towards the organization and development of national or international bibliographic projects, the existing international bibliographic undertaking for zoology, *i. e.*, the Concilium Bibliographicum in Zurich, long approved by this association and in part supported by numerous grants from its funds, be kept definitely in mind and included in any plan for bibliographic work presented for consideration by the special committee of the council."

At the meeting of the general committee at the Schenley Hotel on the night of December 31, it was decided to hold the next meeting of the association in Boston, Massachusetts, meeting to begin on Friday, December 27, 1918. This decision was adopted with the amendment that the committee on policy be given the power to cancel the meeting, or to change the place for it should they see best to do so. On motion the general committee recommended to the general committee of 1918 that St. Louis be chosen for the place of meeting following Boston.

The following officers were elected, President, John M. Coulter, of the University of Chicago; Vice-presidents as follows:

Section A, George D. Burkhoff, Harvard University;
B, Gordon T. Hull, Dartmouth College;
C, Alexander Smith, Columbia University;
D, Ira N. Hollis, Worcester Polytechnic Institute;
E, David White, U. S. Geological Survey, Washington, D. C.;
F, Wm. Patten, Dartmouth College;
G, A. F. Blakeslee, Cold Spring Harbor;
H, (no election);
I, John Barrett, Washington;
K, Frederic S. Lee, Columbia University;
L, S. A. Courtis, Detroit, Mich.;
M, H. P. Armsby, Pennsylvania State College.

O. E. Jennings, of the Carnegie Museum, Pittsburgh, was elected general secretary for 1918. The following secretaries of sections were then elected:

Section A, F. R. Moulton, University of Chicago;
C, Arthur A. Blanchard, Massachusetts Institute of Technology;
D, F. L. Bishop, University of Pittsburgh;
F, H. V. Neal, Tufts College;
G, Mel. T. Cook, Rutgers College;
H, E. K. Strong, Jr., Washington;
L, B. T. Baldwin, Swarthmore College.

L. O. HOWARD,
Permanent Secretary